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FISCHER has also investigated the biology of *Armillaria mucida*,[9] more especially with a view to determining whether the fungus is a parasite or a saprophyte. Most writers simply state that the fungus grows on beech trees, but MASSEE records that "at High Beech, Epping Forest, ... a healthy branch of a beech having been broken off, the wound was inoculated with the spores of *A. mucida.* At the end of the second season after the inoculation the branch was killed for a considerable distance, and the sporophores of the fungus appeared in abundance." FISCHER, unwilling to accept this observation as proof that the fungus is a parasite, has attempted to infect wounds made in living beech trees with spores or with mycelium. His experiments gave negative results, so that he was unable to obtain any proof of the alleged parasitism of the fungus. On the other hand, he found that the fungus could be grown readily as a saprophyte on various substrata, such as bread, dead beech wood and twigs, and also upon gelatin containing beerwort, meat extract, or malt extract. The time elapsing between the sowing of the spores and the ripening of the fruit bodies in pure cultures varied from 51 to 109 days. The spores germinate readily in water as well as in various culture media. FISCHER'S inoculations were carried out on thin branches. Possibly, if stouter branches containing older wood had been used, positive results might have been obtained. So far, however, there does not seem to be any clear evidence that the mycelium of *A. mucida* can kill the living parenchyma and medullary ray cells in beech wood.

FISCHER states that a spore, after arising somewhat laterally on its sterigma, "only assumes the central position later on as it approaches maturity." The figure given of the mature basidium does not support the statement that the spore is situated symmetrically over the sterigma. If FISCHER'S observation is correct, then *Armillaria mucida* is a marked exception to the general rule for the position of the mature spores in Hymenomycetes. There is one misquotation, doubtless due to a printer's error, from a paper by the writer. The number of spores that I found to have been produced from a large fruit body of *Polyporus squamosus* was 11,112,500,000, and not 11,112,500 as stated.[10] FISCHER urges that since the number of spores produced from a fruit body is so vast, wounds on trees must often become infected, and that stumps or timber infected with *Armillaria mucida*, as well as its fruit bodies, should be destroyed when possible. It may be added that eleven thousand million spores would be sufficient to provide one for each square inch in nearly three square miles of level ground.—A. H. REGINALD BULLER.

Chemotropism of pollen tubes.—In 1889 MOLISCH showed that pollen tubes grow toward pieces of the stigma (chemotropism), and grow away from the edge of a cover-glass preparation (aerotropism). Five years later MIYOSHI found that various carbohydrates deflected pollen tubes, and in 1899 LIDFORSS reported that they were responsive also to certain proteins. In the last ten years, with the exception of a few papers by the same author, nothing has appeared on the responses of pollen tubes. Now LIDFORSS, who has been prosecuting his researches year after year, in the short periods available each season for any particular plant, presents the results in detail.[11] First he discusses the effect of various chemical agents upon the germination of the pollen. In the section on proteo-chemotropism, LIDFORSS lists the large number of proteins of various groups that have yielded definite results. In general it may be seen that the pollen tubes are indifferent to cleavage products of proteins, and are harmed by the albumoses and peptones tried. On the contrary, to the albumins, globulins, nucleo-albumins, coagulated proteins, and glycoproteins, nineteen in all, the tubes respond by positive curvatures. The nucleo-proteins differ much, some being attractive, some apparently indifferent, and some poisonous. Besides the tropic action of the proteins, they accelerate the growth of the tubes, which also tend to branch in some cases. The reaction time in most favorable cases for *Vallota purpurea* is less than 5 min., and for *Narcissus Tazetta* and *Tradescentia virginica* less than 2–3 min. The liminal value of the concentration was difficult to determine. In the case of diastase with *Vallota purpurea* it was about 0.1 per cent. Only one case of apochemotropism with proteins was observed (*Scilla campanulata* with diastase), and as this could not be confirmed by later experiments it was possibly due to some impurity of the diastase used. Proteo-chemotropism has been found in 13 families of monocotyls and 42 families of dicotyls, so that it may be considered as of general occurrence in angiosperms.

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[9] FISCHER, C. C. E., The biology of *Armillaria mucida* Schräder. Annals of Botany **23**:515–535. *pls. 36, 37.* 1909.

[10] BULLER, A. H. R., The biology of *Polyporus squamosus* Huds., a timber-destroying fungus. Jour. Econ. Biol. **1**:114. *fig. 6.* 1906; also Researches on Fungi. Part I, chap. 5, 1909. London: Longmans, Green & Co.

Saccharo-chemotropism was not investigated extensively by LIDFORSS, but his limited observations, combined with those of MIYOSHI, make it probable that responses to various carbohydrates are also general among angiosperms. Osmotropism was clearly shown by some tubes, and the author promises a later paper on this subject. In a special part, an appendix to the body of the paper, there are details regarding all the species of pollen studied, as to favorable conditions for germination and the responses obtained. These furnish useful details for laboratory directions in employing these experiments in instruction.—C. R. B.

Persistence of characters in Aspergillus.—KOMINAMI[12] has investigated the persistence of characteristics induced in *Aspergillus niger* by subjecting that mold to unusual cultural conditions, in this case strong solutions of common salt. The conidia used in the experiments were obtained from three strains: (1) from cultures on normal nutrient media; (2) from cultures grown for one generation on nutrient solution containing 6 per cent. of salt; and (3) from cultures grown for

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[11] LIDFORSS, B., Untersuchungen über die Reizbewegungen der Pollenschläuche. I. Der Chemotropismus. Zeit. Bot. **1**:443–496. *pl. 3.* 1909.

[12] KOMINAMI, K., Biologisch-physiologische Untersuchungen über Schimmelpilze. Jour. Coll. Sci. Tokyo **27**:1–33. *pls. 3.* 1909.